



Arizona Trauma System: Patient Profile

2007

Trauma System Annual Report

Data Sources

Arizona Hospital Discharge Database, 2006

Arizona State Trauma Registry, 2006

**Arizona Department of Health Services
Bureau of Emergency Medical Services and Trauma
System**

Arizona Trauma System

Annual report

2007

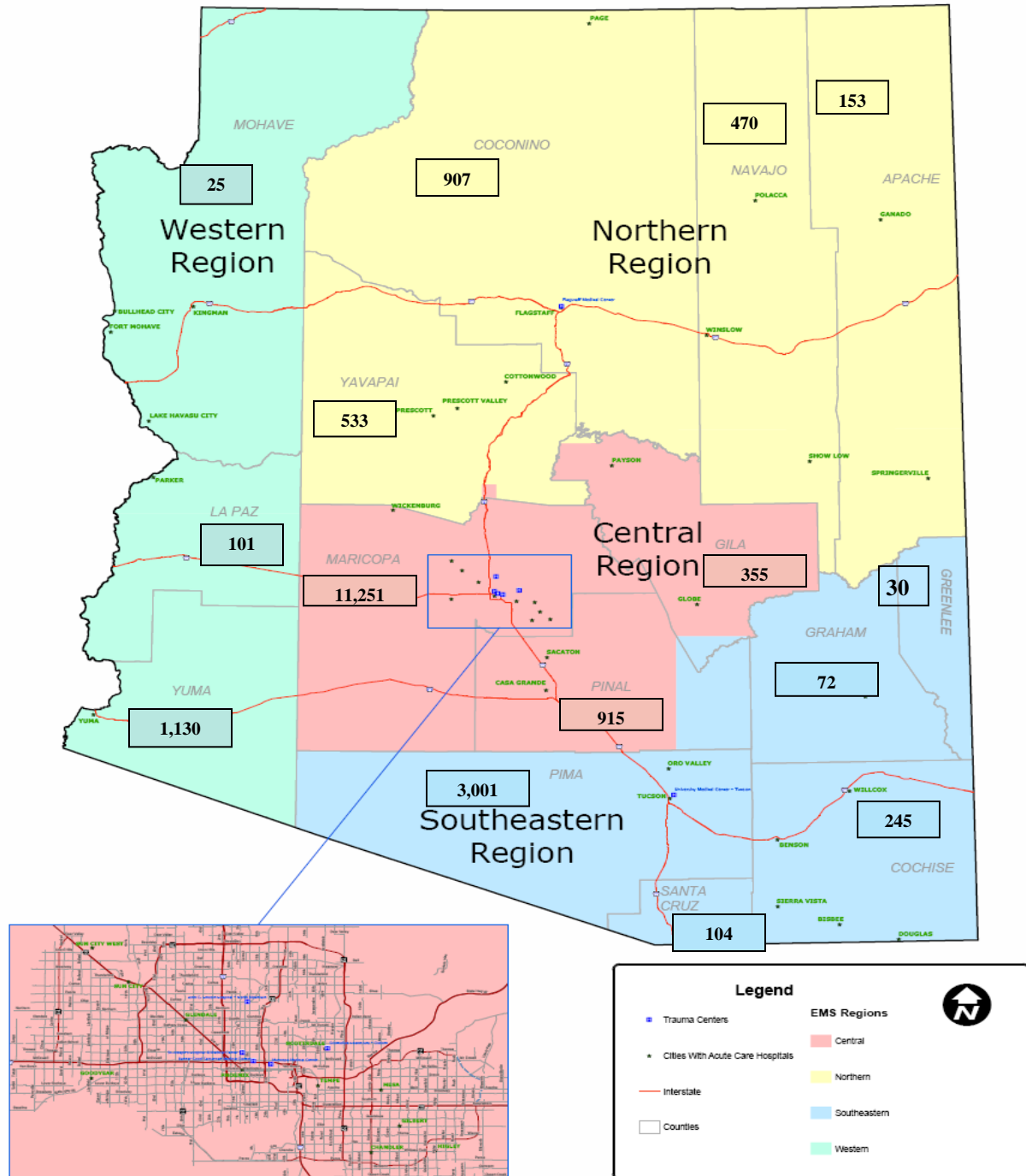


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Trauma System Patients by County of Injury 2006

EMS Regions and Trauma Centers



TRAUMA CASE COUNT LEGEND

In-State Cases	19,292
Other (Out-of-State)	418
Missing County	4,017
Total Cases	23,727

Executive Summary

- In 2006, total charges in Arizona due to trauma related cases were more than \$927 million, \$10 million higher from 2005.
- The highest charges were due to motor vehicle crashes (> \$241 million) followed by falls (> \$195 million).
- A quarter of the trauma patients had AHCCCS/Medicaid as the primary payer, accounting for more than \$287 million total charges, \$8 million higher from 2005.
- In 2006, a total of 23,727 trauma patients were admitted to trauma centers in the state of Arizona.
- Pediatric patients (aged 0-19 years) accounted for 24.4.0% of cases, while geriatric patients (aged 55 years and older) accounted for 14.1% of cases.
- Males accounted for the majority of trauma patients (68.0%).
- Eighty-two percent of trauma patients incurred injuries by unintentional means, while 14.6% incurred injuries intentionally.
- Overall, motor vehicle crashes were the single greatest mechanism of injury (64.2%) with falls second (11.0%). However, for ages 15-19, firearms were the second leading cause of injury (8.1%).
- In 2006, 839 (3.5%) patients died of traumatic injury in the state of Arizona. The pediatric population had a fatality rate of 2.7% and the elderly population had the highest fatality rate of 6.6%.
- Motor vehicle crashes accounted for the greatest number of deaths (53.3%), with firearms second (23.5%).
- Motor vehicle crashes resulted in 14,824 years of potential life lost with 438 premature deaths in Arizona in the year 2006.
- In motor vehicle crashes, 39.0% of patients were reported as using no restraint device when the motor vehicle they were driving or riding in crashed.
- In motorcycle crashes, 51.3% of the motorcyclists were reported as wearing no helmet; and 66.9% of the bicyclists were reported as wearing no helmet.
- Among pediatric patients, 46.8% of trauma patients were reported as using no restraint device (seatbelt or car seat). Of the geriatric trauma patients, 23.9% were reported as using no restraint device (seatbelt) when the motor vehicle they were driving or riding in crashed.
- Overall, 17.5% of the trauma patients tested positive for a blood alcohol level of ≥ 0.08 gm/100cc and 18.7% tested positive for drug screen test.
- Approximately 12% of pediatric patients (age 15 to 19 years) and 8.6% of geriatric patients tested positive for a blood alcohol level of ≥ 0.08 gm/100cc.
- Of the 15-19 pediatric age group, 21.40% tested positive on the drug screen test and 9.6% of geriatric patients also tested positive.
- Most of the trauma patients receiving care at the reporting hospitals had an Injury Severity Score (ISS) between 1 to 4 (46.3%), while 17% of the patients had severe injuries with an ISS > 15.

Total charges Related to Trauma in the State of Arizona 2006

Arizona Hospital Discharge Database for the year 2006 was queried to identify all patients whose primary discharge diagnosis fell within the ICD-9 code ranges 800 through 959.9, amounting to 20,298 trauma cases. (Codes involving isolated femoral neck (hip) and distal extremity fracture from a same-level fall and non-acute injury related diagnoses were excluded from this analysis).

Total Charges by Mechanism of Injury

In 2006, total charges in Arizona due to trauma related cases were more than \$927 million, \$10 million higher from 2005 (Table 1). The highest charges were due to motor vehicle crashes (more than \$241 million) followed by falls (more than \$195 million).

("Total Charges" means the whole dollar amount for services provided during an episode of care. This amount does not reflect the cost of providing the services, nor the specific payment that the hospital actually received for that episode of care.)

Table 1: Total Charges by Mechanism of Injury

Mechanism of Injury	Total Charges
Cut/Pierce	\$31,559,484
Fall	\$195,406,028
Firearm	\$55,071,190
MV Occupant	\$241,224,570
MV Motorcyclist	\$65,872,694
MV Pedalcyclist	\$12,414,102
MV Pedestrian	\$49,004,538
MV Other	\$56,140,324
Transport, Other	\$11,699,286
Struck by, Against	\$42,981,155
Other	\$166,422,715
Total charges	\$927,796,086

Total Charges by Age Groups

Total charges due to trauma were highest for patients aged 35-54 years (more than \$271 million) followed by patients aged 20-34 years (more than \$246 million) (Table 2).

Table 2: Total Charges by Age

Age Groups	Total Charges
0-2	\$11,422,174
3-8	\$20,346,247
9-14	\$24,095,861
15-19	\$80,675,072
20-34	\$246,339,497
35-54	\$271,971,728
55-64	\$90,996,327
65-74	\$64,537,621
75-84	\$71,831,820
85+	\$44,614,557
Missing Age	\$965,182
Total	\$927,796,086

Primary Payer Mix

A quarter of the trauma patients had AHCCCS/Medicaid as the primary payer, accounting for more than \$287 million total charges, \$8 million higher from 2005 (Table 3).

("Payer" means the expected source of payment for the majority of the charges billed for the episode of the care).

Table 3: Primary Payer Mix

Primary Payer	Total Charges
Self pay	\$77,826,032
Private Insurance	\$241,036,649
Medicare	\$184,333,783
AHCCCS/Medicaid	\$287,572,462
Worker's Compensation	\$52,853,459
Other	\$84,173,701

Arizona Trauma System Profile 2006

Eleven hospitals contributed 2006 trauma data to the Arizona State Trauma Registry (ASTR). Of the eleven hospitals that contributed data, seven are designated as Level I Trauma Centers and four hospitals are non-designated. Two of the non-designated facilities submitted only partial data for 2006. As ASTR receives data from a limited number of hospitals in Arizona, the records in this report are not representative of all Arizona trauma cases statewide.

The 2006 ASTR data was tested for several quality control checks. The quality check results were sent to reporting hospitals. Data entry and system errors were corrected by reporting facilities and the data was resubmitted to ASTR. Other data entry and system errors may be present in the 2006 data.

This report summarizes data compiled from the ASTR for the 2006 year. It is important to note that data and rates in this report are subject to change as data are quality controlled. This report reflects trauma data as it existed in the ASTR database on 9/1/07. There were 23,727 records submitted to ASTR with emergency department and admit arrival dates from 1/1/06 to 12/31/06.

Trauma Volume

Figure 2 demonstrates the volume of adult and pediatric trauma patients in the state of Arizona. Pediatric patients are defined as ages 0-19 years. Approximately a quarter of the trauma patients were pediatric patients. Among the pediatric patients, 2,425 (41.8%) cases were younger than 15 years and 3,371 (58.2%) cases were 15-19 years old. There were 289 (1.2%) patients aged 1 year or less when they entered the trauma system. Among the adult patients, 34.2% of the patients were 20-34 years old and 14.1% of patients were geriatric trauma patients (ages 55 years and older).

Gender

Males represent a greater share of the trauma volume than do females (Figure 3). Sixty-eight percent of all trauma patients were male and 32% were female. The proportion of males is higher than females in all age groups from birth to 84 years of age. However, in ages 85 and older, the proportion of females is higher than males.

Figure 2: Adult and Pediatric Trauma Volume

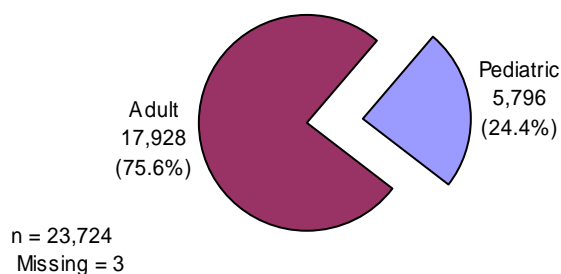
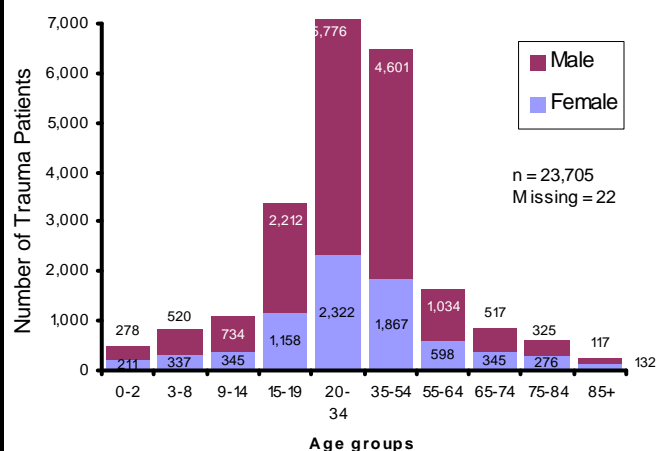


Figure 3: Trauma Patients by Age and Gender



Fatalities by Age

In 2006, 839 (3.5%) patients died of traumatic injury. This number does not include deaths occurring at the scene, during transport or deaths occurring soon after discharge from the hospital. The highest fatality rate was among patients aged 85 years and older (14.5%) (Figure 4).

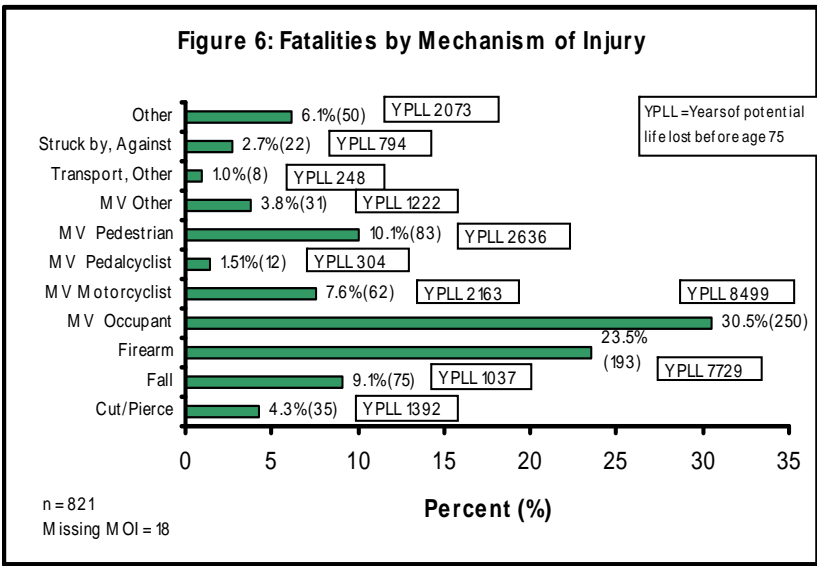
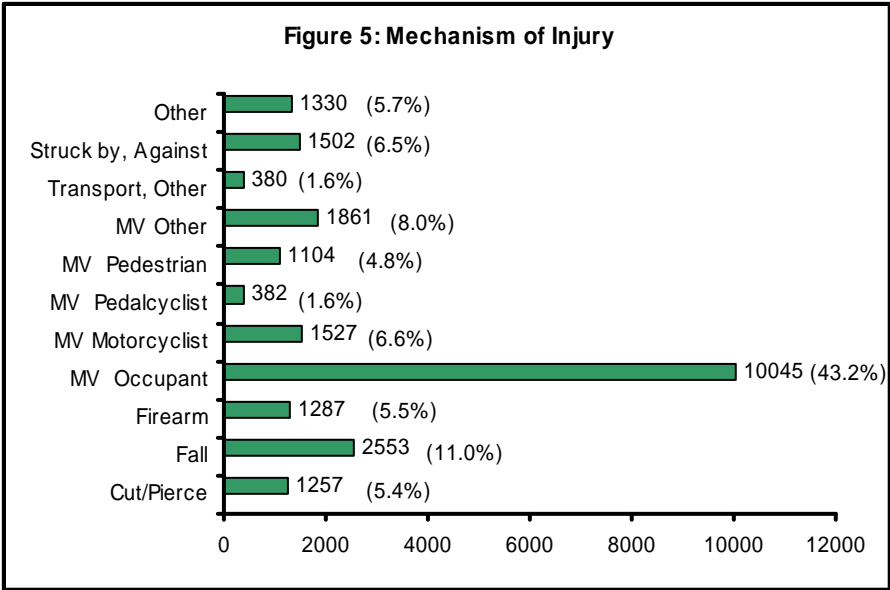
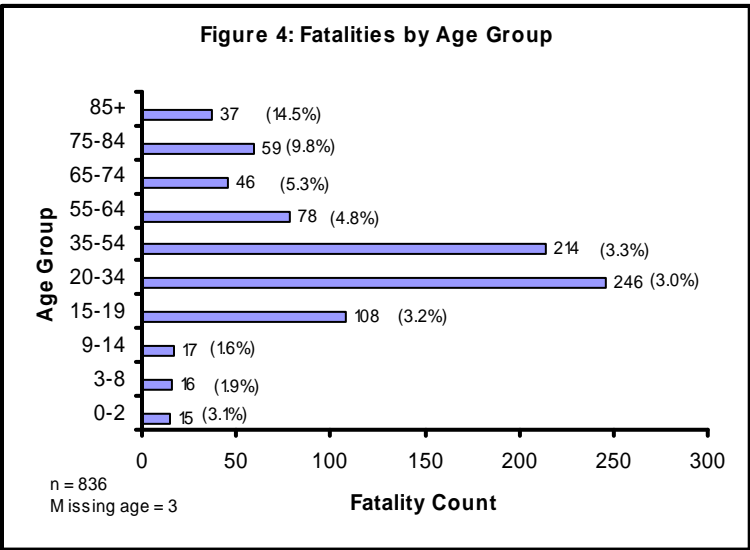
Mechanism of Injury (MOI)

Motor vehicle crashes are the predominate mechanism of injury and represent 64.2% of all traumatic injuries reported (Figure 5). Of all the motor vehicle crashes, 4.8% of trauma patients were pedestrian and 1.6% were pedal-cyclists who incurred their injuries due to motor vehicle crashes. Falls are the second highest cause of injury representing 11.0% of cases. Injuries resulting from being struck by or striking against objects or persons accounted for 6.5 % of cases and represents the third highest cause of injury.

(Transport, other includes railroad, water transport, animal-drawn transport, off-road vehicles, etc.)

Fatalities by Mechanism of Injury

Of all trauma patients, 3.5% (839) of trauma patients died in the state of Arizona. Motor vehicle (MV) crashes accounted for the highest number of fatalities (53.3%) with MV Occupant 30.5%, MV Pedestrian 10.1%, MV Motorcyclist 7.6%, MV Pedal-cyclist 1.5%, and MV other 3.8% (Figure 6). After motor vehicle crashes, firearm related deaths accounted for the second highest cause of fatalities (23.5%) and falls accounted for the third highest cause of fatalities (9.1%). Motor vehicle crashes resulted in 14,824 years of potential life lost with 438 premature deaths in Arizona in the year 2006.



Types of Injury

Trauma injuries were further classified as Unintentional and Intentional injuries; and based on the gross mechanism as Blunt and Penetrating injuries.

Unintentional Injuries

Eighty-two percent of traumatic patients incurred their injuries by unintentional means (Figure 7). Motor vehicle crashes were the most significant cause of unintentional injuries, followed by falls. Among the trauma patients who incurred their injuries by unintentional means, 2.9% (570) of patients died. The most lethal mechanism was pedestrians struck by motor vehicles with a fatality rate of 7.5%(Table 4).

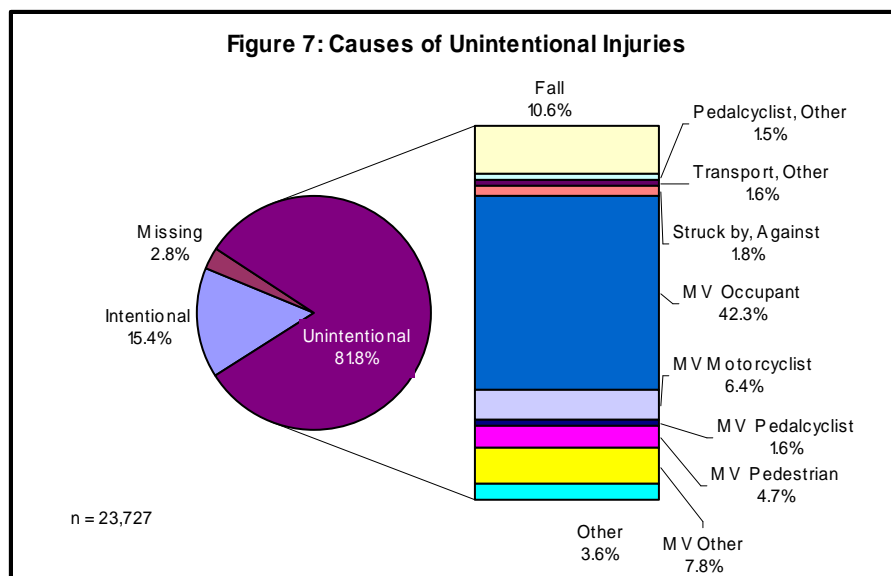


Table 4: Unintentional Injuries and Fatalities

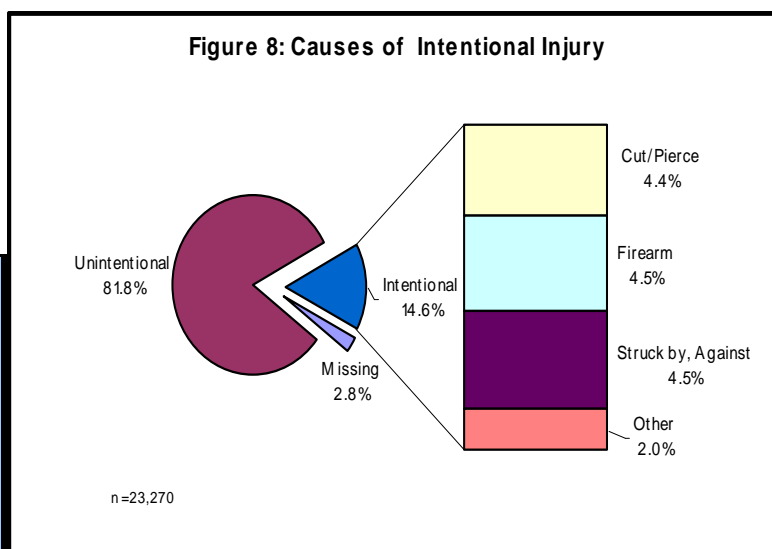
Unintentional Injuries	Number of Patients	Number of Deaths (%)
Fall	2,513	75 (3.0%)
Pedalcyclist, Other	346	4 (1.2%)
Transport, Other	380	8 (2.1%)
Struck by, Against	416	7 (1.7%)
MV Occupant	10,045	250 (2.5%)
MV Motorcyclist	1,527	62 (4.1%)
MV Pedalcyclist	382	12 (3.1%)
MV Pedestrian	1,104	83 (7.5%)
MV Other	1,841	31 (1.7%)
Other	847	38 (4.5%)
Total Unintentional Injuries	19,401	570 (2.9%)

Intentional Injuries

Fifteen percent of traumatic patients incurred their injuries intentionally (Figure 8). The most common and the most lethal intentional injury was firearms (4.5% with a fatality rate of 15.4%) (Table 5). Among the trauma patients who incurred their injuries by intentional means, 6.3% (229) of patients died.

Table 5: Intentional Injuries and Fatalities

Intentional Injuries	Number of Patients	Number of Deaths (%)
Cut/Pierce	1,049	33 (3.2%)
Firearm	1,060	163 (15.4%)
Struck by, Against	1,072	15 (1.4%)
Other	470	18 (3.8%)
Total	3,651	229 (6.3%)



Blunt Injury

Just over 86% of trauma cases were the result of blunt injury (Figure 9). Once again, motor vehicle crashes were the predominate mechanism of blunt injury, followed by falls. The most lethal mechanism of injury was pedestrians struck by motor vehicles, resulting in a 7.6% mortality rate (Table 6). The motor vehicle crashes accounted for the highest volume of deaths (248 deaths).

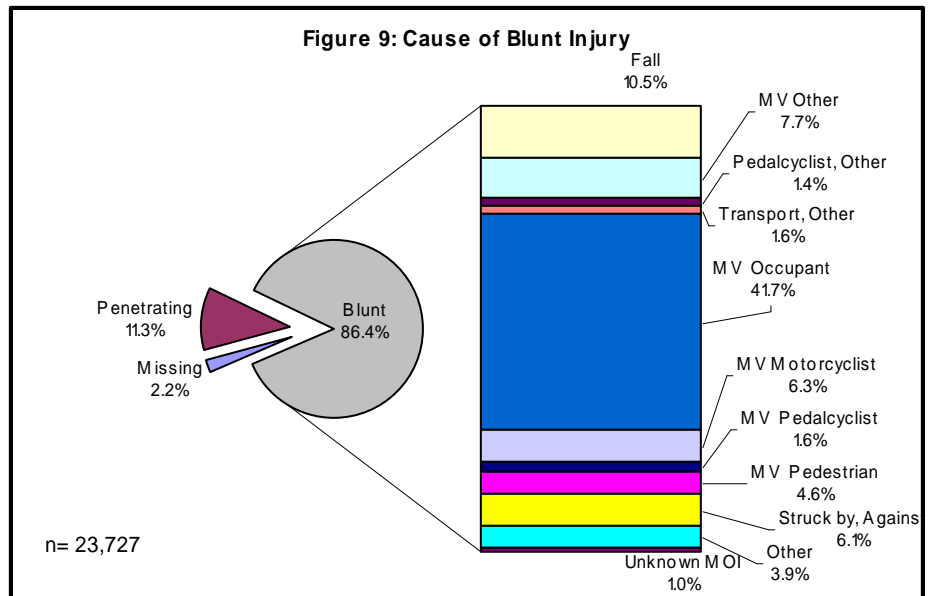


Table 6: Blunt Injuries and Fatalities

Blunt Injuries	Number of Patients	Number of Deaths (%)
Fall	2,497	74 (3.0%)
MV Other	1,819	30 (1.7%)
Pedalcyclist, Other	341	4 (1.2%)
Transport, Other	369	8 (2.2%)
MV Occupant	9,895	248 (2.5%)
MV Motorcyclist	1,501	62 (4.1%)
MV Pedalcyclist	377	12 (3.2%)
MV Pedestrian	1,092	83 (7.6%)
Struck by, Against	1,443	22 (1.5%)
Other	924	40 (4.3%)
Total	20,258	583 (2.9%)
Unknown MOI	249	

Penetrating Injury

Approximately 11% of trauma was the result of penetrating injury (Figure 10). The predominate mechanism of penetrating injury was due to firearm related injuries, followed by cut/pierce. The firearm injuries also resulted in the highest mortality rate of 15.3% (187 deaths) (Table 7). Overall, penetrating injuries were responsible for a total of 235 deaths.

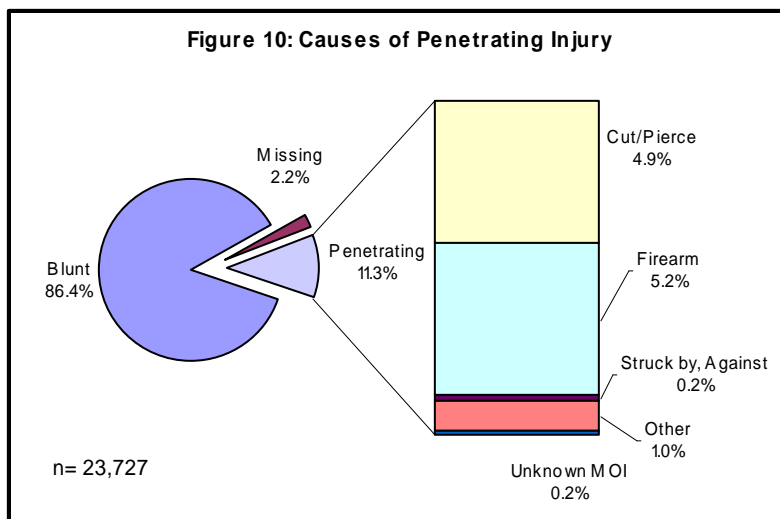


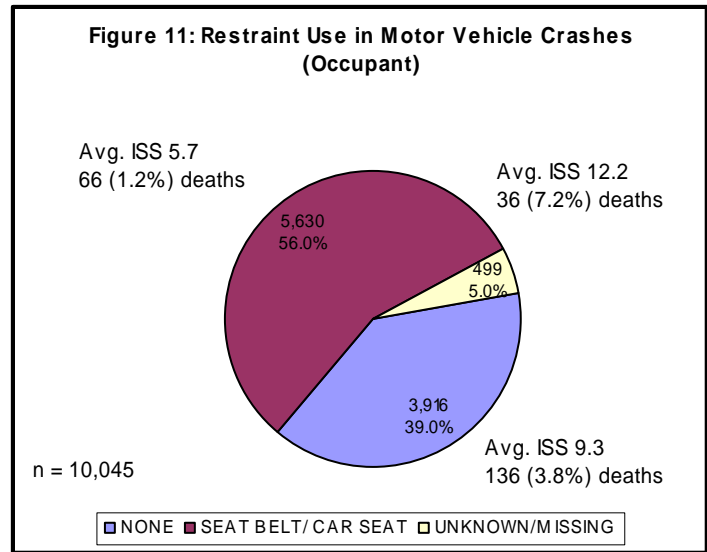
Table 7: Penetrating Injuries and Fatalities

Penetrating Injuries	Number of Patients	Number of Deaths (%)
Cut/Pierce	1,154	35 (3.1%)
Firearm	1,225	187 (15.3%)
Struck by, Against	39	0
Other	235	13 (5.6%)
Total	2,653	235 (8.9%)
Unknown MOI	37	

Protective Devices Used in Motor Vehicle Crash, Motorcycle Crash, and Bicycle Crash

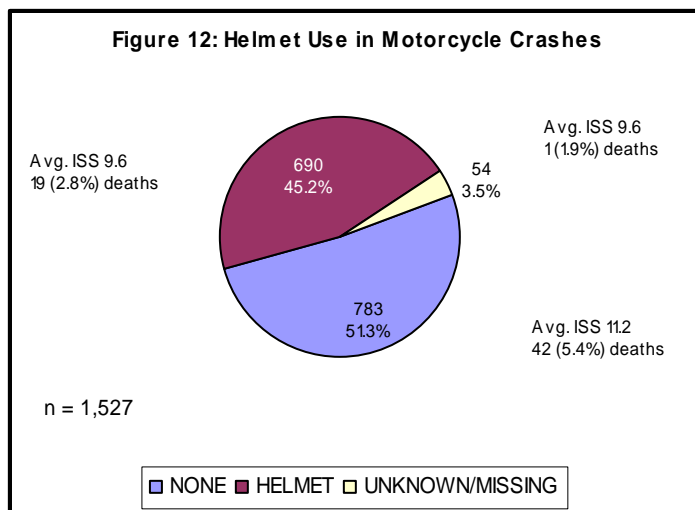
Restraint Use in Motor Vehicle Crash

Thirty-nine percent of patients were reported as using no restraint device when the motor vehicle they were driving or riding in crashed (Figure 11) as compared to 35% in 2005. The average Injury Severity Score (ISS) was lower for those who utilized a restraint device (ISS 5.7) as compared to those who did not use any device (ISS 9.3). The incidence of death was also lower for those who utilized a restraint device (1.2%) as compared to those who did not use any device (3.8%). (This analysis includes MV occupant only cases).



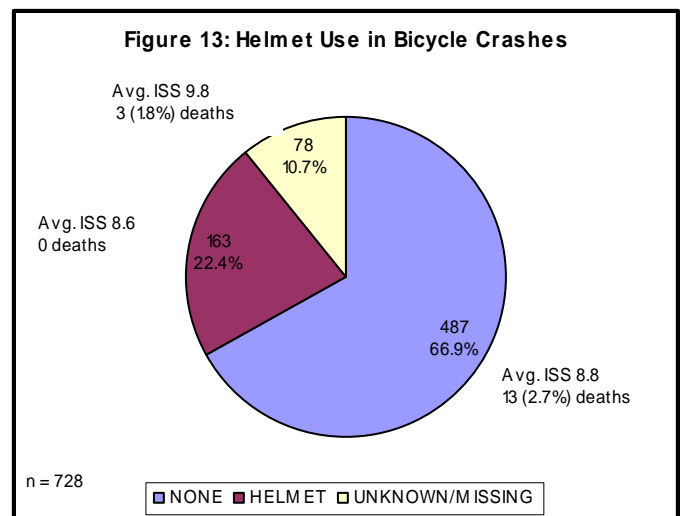
Helmet use in Motorcycle Crash

A total of 1,527 motorcyclists were admitted to a reporting hospital due to a crash (Figure 12). Fifty-one percent (783) of these motorcyclists did not wear a helmet. While the average ISS was not that different for those who wore a helmet (ISS 9.6) compared to those who did not (ISS 11.2), the mortality rate was higher in the non-helmet population (5.4% vs. 2.8%).



Helmet Use in Bicycle Crash

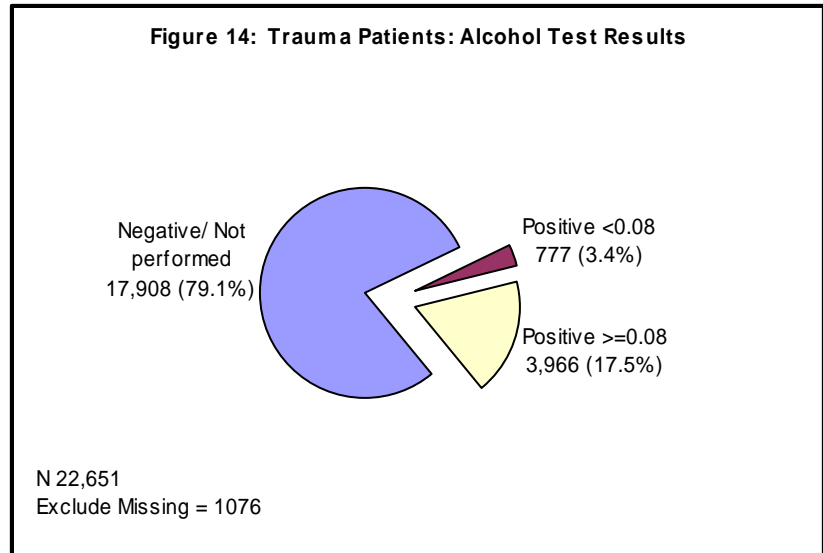
A total of 728 bicyclists were admitted to a reporting hospital due to a crash (Figure 13). Sixty-seven percent of these patients did not wear helmets. While the average ISS did not differ between the helmeted (ISS 8.6) and non-helmeted group (ISS 8.8), the mortality rate was almost three times higher in the non-helmeted group (2.7% vs. none).



Trauma Patients: Alcohol and Drug Test Results

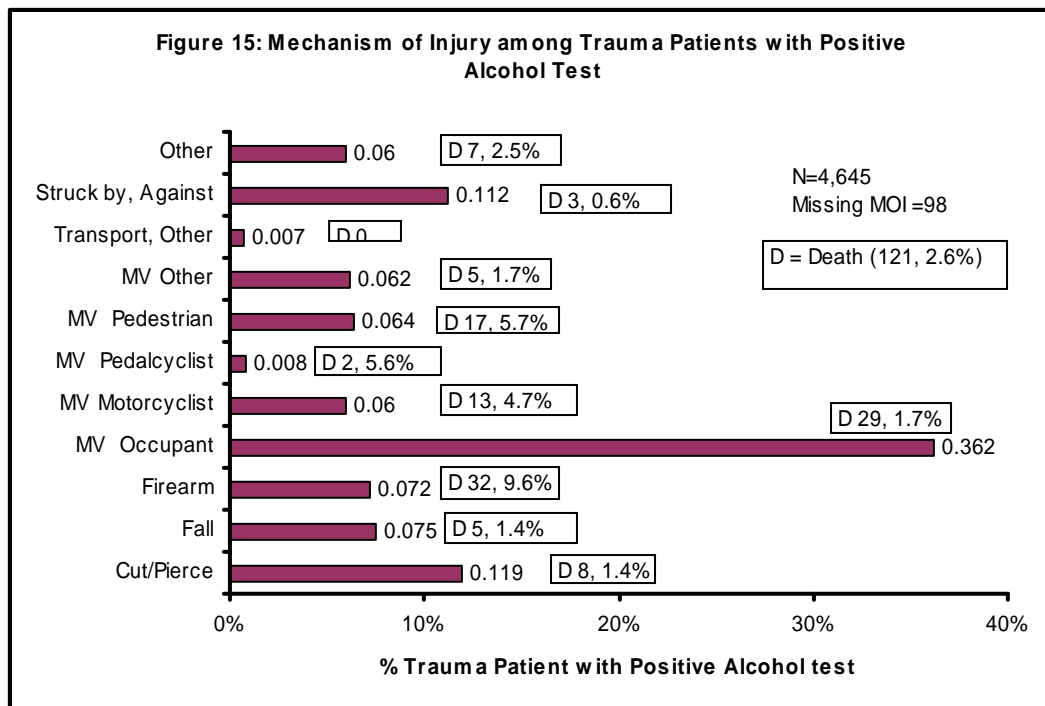
Alcohol Test Results

Of the 22,651 patients treated in reporting hospitals, 4,743 (20.9%) patients tested positive for blood alcohol: 3.4% had an alcohol level of <0.08 gm/100cc and 17.5% tested positive at a level above the legal limit of ≥ 0.08 gm/100cc (Figure 14). (The percent of patients with negative test result or test not performed are combined as the trauma registry does not have the capacity to separate them at this point).



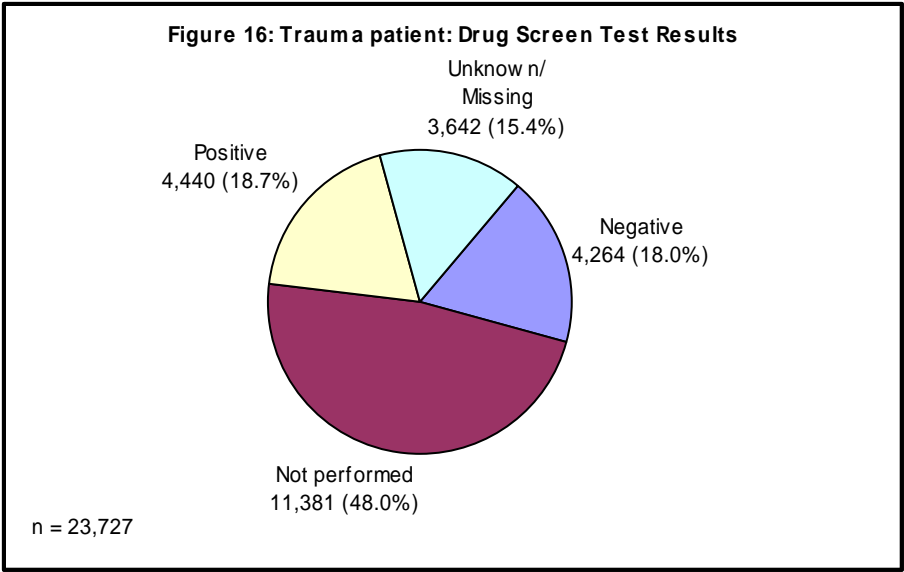
Mechanism of Injury among Trauma Patients with a Positive Alcohol Test

Among the patients who tested positive for alcohol, motor vehicle crash was the main cause of injury (36.2%) followed by cut/pierce (11.9%) (Figure 15). Deaths are indicated for each mechanism of injury. The most lethal mechanism of injury associated with a positive alcohol test was firearm related injuries (9.6% mortality), followed by pedestrian struck by a motor vehicle (5.7%).



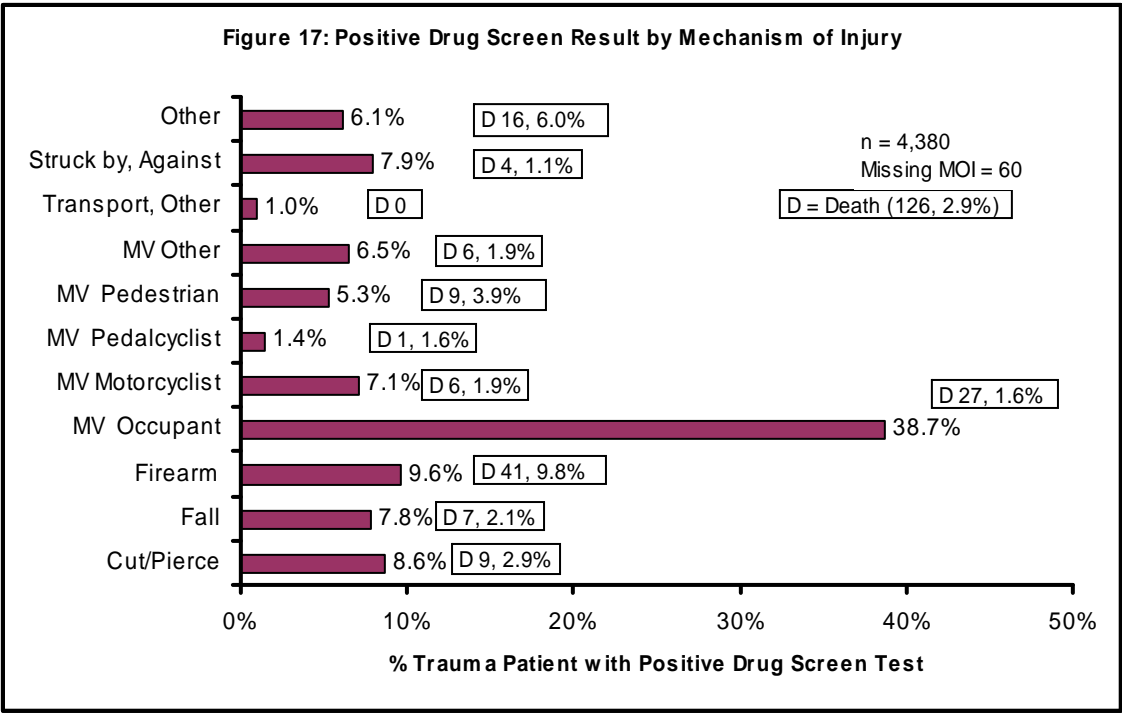
Drug Screening Test Results

Of the 23,727 injured patients treated in reporting hospitals, 4,440 (18.7%) tested positive for drugs, 18.0% tested negative, and 48.0% had no drug test performed (Figure 16).



Mechanism of Injury among Trauma Patients with a Positive Drug Screen Test

Among the patients tested positive for a drug screen, motor vehicle crash was the predominate mechanism of injury (38.7%) followed by firearm related injuries (9.6%), and cut/pierce (8.6%) (Figure 17). The number of deaths are indicated for each mechanism of injury. The most lethal mechanism of injury is firearm injuries with a mortality rate of 9.8% (41).

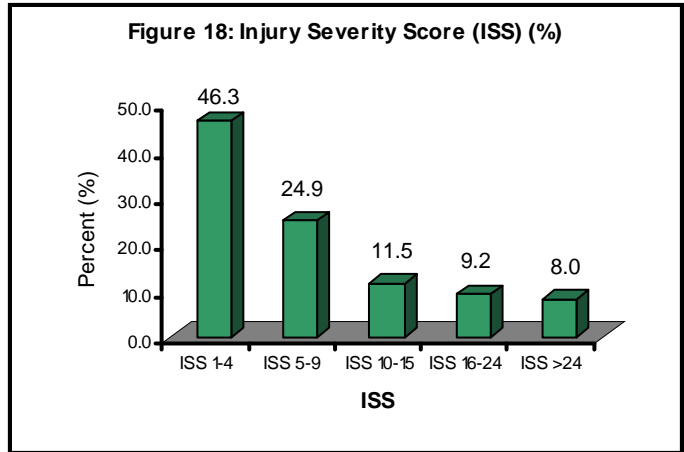


Injury Severity Score (ISS)

The Injury Severity Score (ISS) is a numerical value from 1 to 75 indicating the severity of an injury. The higher the number, the more severe the overall injuries. Each trauma patient is assigned a score based on the sum of squares of the Abbreviated Injury Scale (AIS) scores of the three most severely injured body regions.

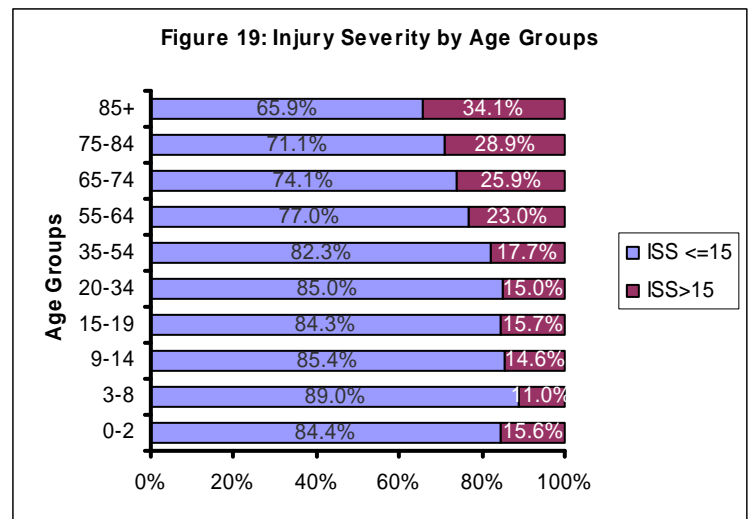
Injury Severity Score

Most of the trauma patients receiving care at the reporting hospital had an ISS between 1 and 4 (46.3%, n=10,982) (Figure 18). Seventeen percent of the patients (4,085) had severe injuries with an ISS > 15.



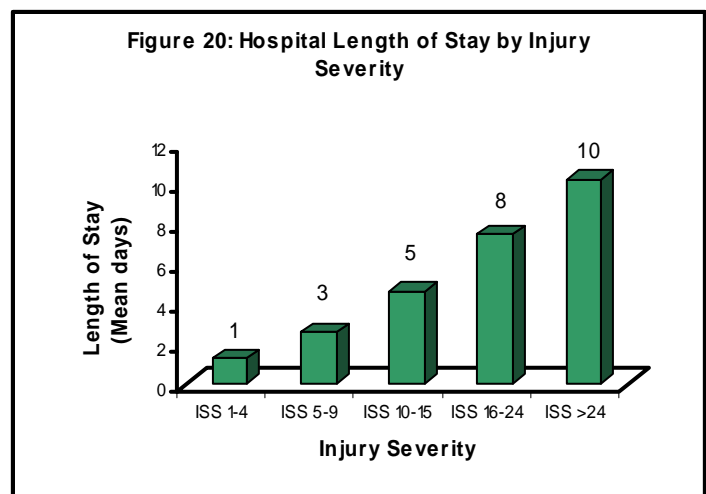
Injury Severity by Age

Trauma patients were considered seriously injured if they present with injuries characterized by an Injury Severity Score (ISS) greater than 15 and less severely injured if they present with an ISS score less than or equal to 15. The incidence of seriously injured patients increases with age (Figure 19). A very high percent of elderly patients aged 85 years and older (34.1%) presented with an ISS of >15 compared to any other age group.



Hospital Length of Stay by Injury Severity

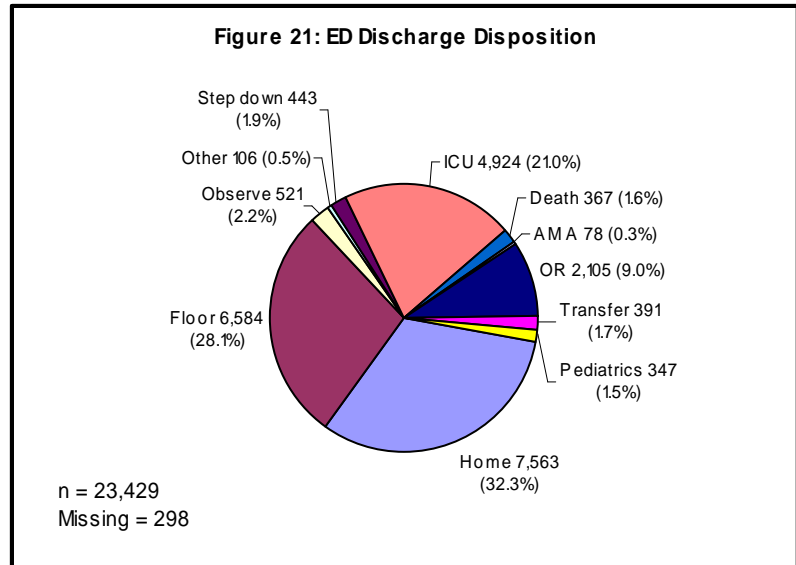
The mean length of stay in the hospital increases as the ISS increases (Figure 20).



Discharge Disposition

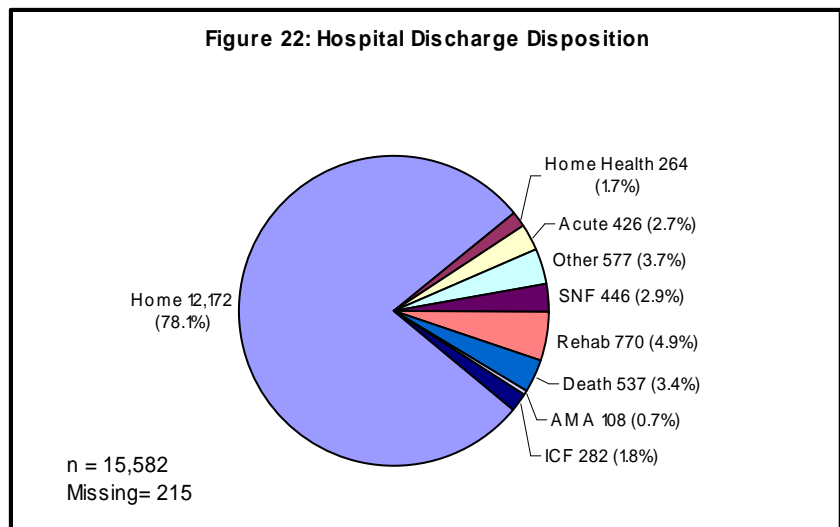
ED Discharge Disposition

For the patients discharged from the emergency department (ED) (Figure 21), 21.0% of patients required treatment in an intensive care unit (ICU), and 28.1% were taken to standard hospital rooms for additional care. Patients discharged home from the ED accounted for 32.3%. Dead on arrival or expired patients accounted for 1.6%.



Hospital Discharge Disposition

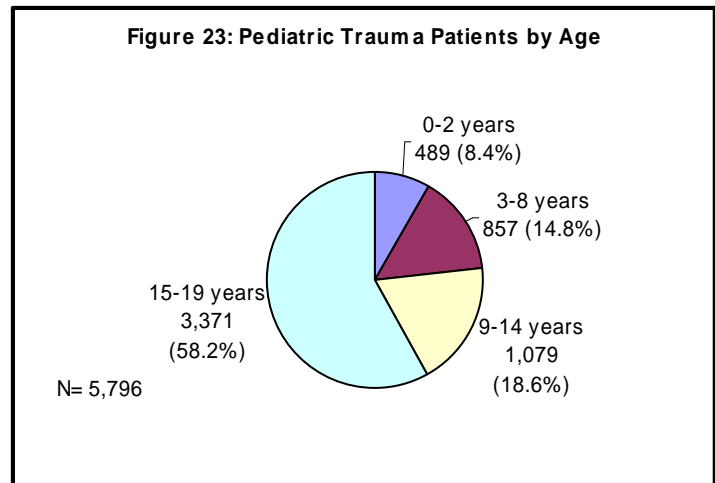
Of the patients that were admitted to the hospital, 78.1% were discharged home. There were 1.7% requiring home health services (Figure 22). Approximately 5% of patients were discharged to a rehabilitation center, while 2.9% required additional care in a skilled nursing facility (SNF).



Pediatric Trauma

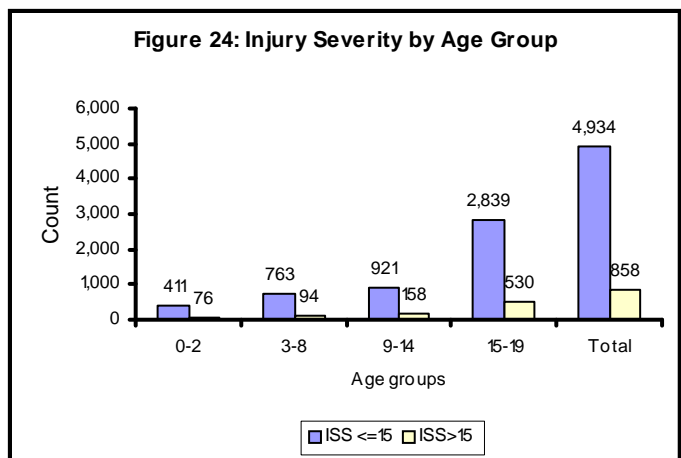
Pediatric Trauma Patients by Age

In the year 2006, a total of 5,796 pediatric trauma patients aged 0-19 years were admitted to reporting hospitals across the state (Figure 23). Most of these patients (58.2%) were between age 15-19 years. Just over eight percent of these patients were age 2 years or younger.



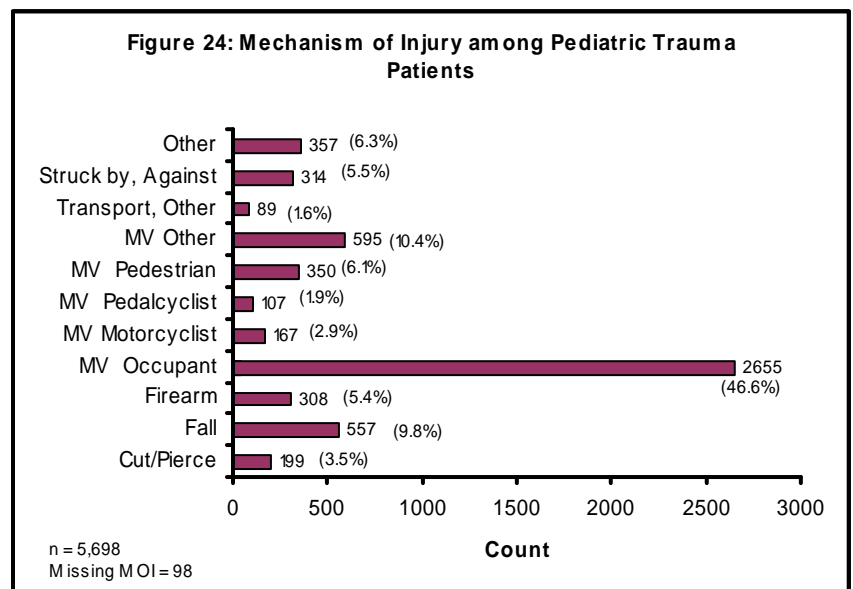
Pediatric Trauma Patient: Injury Severity

Fifteen percent of pediatric patients (858) presented with a serious injury, ISS >15 (Figure 24). The incidence of serious injury increases with age. The incidence of serious injury is highest among young people (15.7%) in the driving ages of 15-19 years.



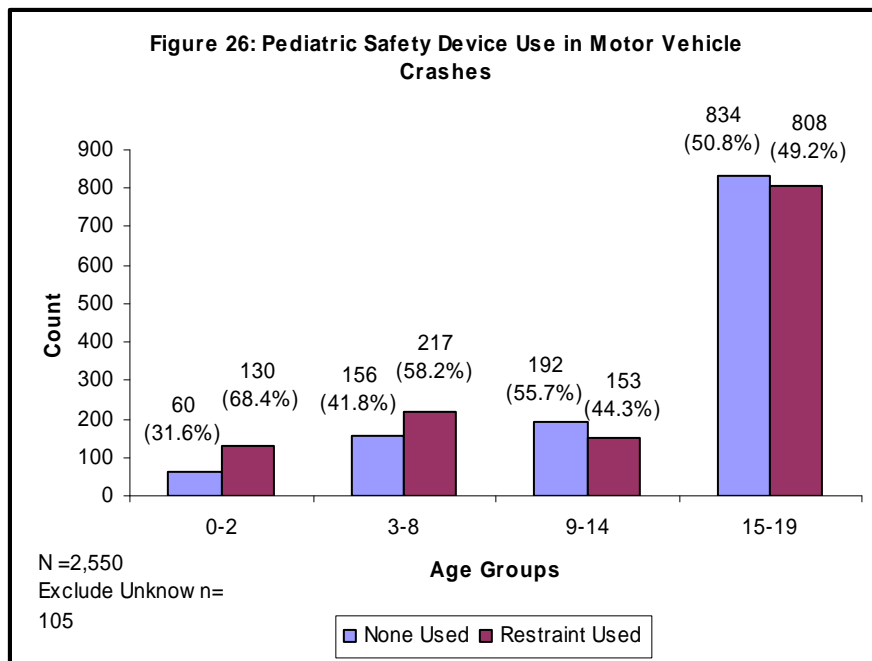
Pediatric Trauma Patient: Mechanism of Injury

Among the pediatric population, motor vehicle crashes were the predominate mechanism of injury (46.6%) followed by falls (9.8%) (Figure 25). However, for ages 15-19, firearms were the second leading cause of injury (8.1%).



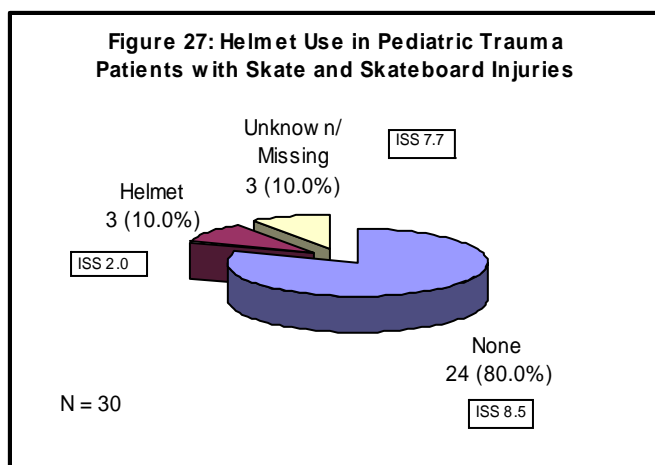
Motor Vehicle Crash

Overall, 46.8% of pediatric trauma patients were reported as using no restraint device (seatbelt or car seat) when the motor vehicle they were driving or riding in crashed. The highest non-restraint use was among pediatric trauma patients aged 15-19 years (50.8%), followed by patients aged 9-14 years (55.7%) (Figure 26). (This analysis includes MV occupant only cases).



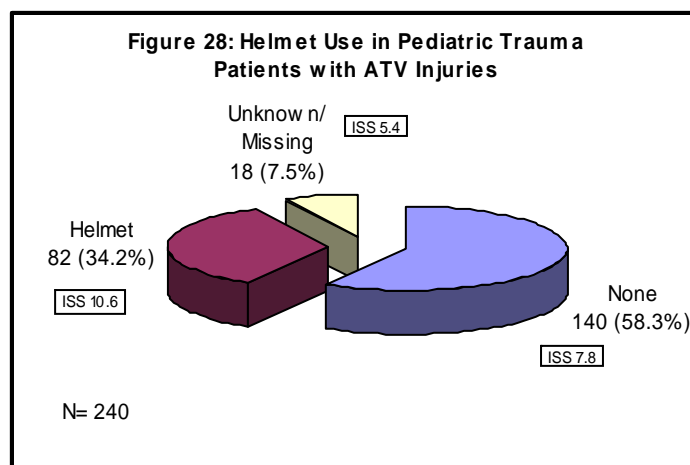
Skate and Skateboard Injuries

Thirty pediatric trauma patients incurred skate or skateboard injuries (E codes 885.1-885.2) in the year 2006 (Figure 27). Three patients (10.0%) were reported as wearing a helmet while using skates or a skateboard. Eighty percent of pediatric patients (24) were reported as wearing no helmet while using skates or a skateboard.



All Terrain Vehicle (ATV) Injuries

In the year 2006, 240 pediatric patients incurred ATV injuries (Figure 28). Thirty-four percent of pediatric patients were wearing helmets when the ATV (E code 821.0, 821.1, 821.8, 821.9) they were driving or riding on crashed and over half of the patients (58.3%) were not wearing helmets.



Pediatric Trauma Patients (Age 15-19 Years): Alcohol and Drug Test Results

Alcohol Blood Test Results

Of the 3,371 pediatric trauma patients (aged 15 to 19 years) treated in reporting hospitals across the state, 504 patients tested positive for a blood alcohol test: 4.1% had an alcohol level of <0.08 gm/100cc and 11.5% tested positive at a level above the legal limit of ≥ 0.08 gm/100cc (Figure 29). Among the pediatric patients testing positive for alcohol, motor vehicle crash (41.4%) was the predominate mechanism of injury, followed by cut/pierce (14.1%) and firearm injuries (12.7%) (Figure 30).

Figure 29: Alcohol Tests Results of Pediatric Trauma Patients

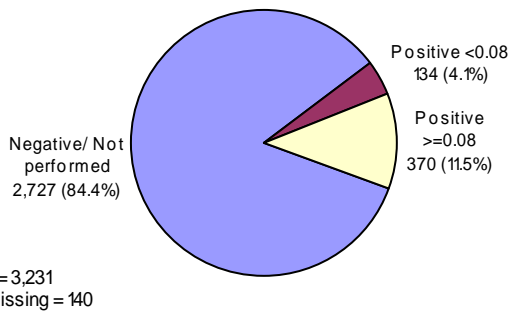
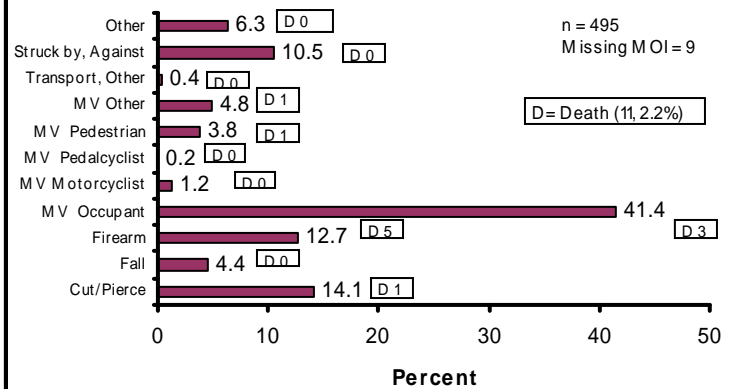


Figure 30: Mechanism of Injury among Pediatric Trauma Patients with Positive Alcohol Test



Drug Screen Test Results

Of the 3,371 pediatric trauma patients aged 15 to 19 years, 720 (21.4%) patients tested positive for drug screen test (Figure 31). Once again motor vehicle crash (44.4%) was the main mechanism of injury among the patients tested positive for drug followed by firearm injuries (12.7%) (Figure 32). Six pediatric patients tested positive for drugs and died due to a motor vehicle crash and eight patients died due to firearm injuries.

Figure 31: Drug Screen Test of Pediatric Trauma Patients

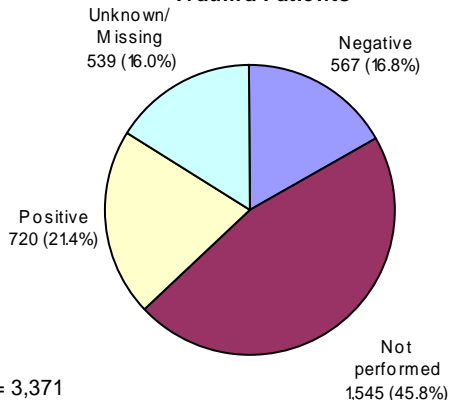
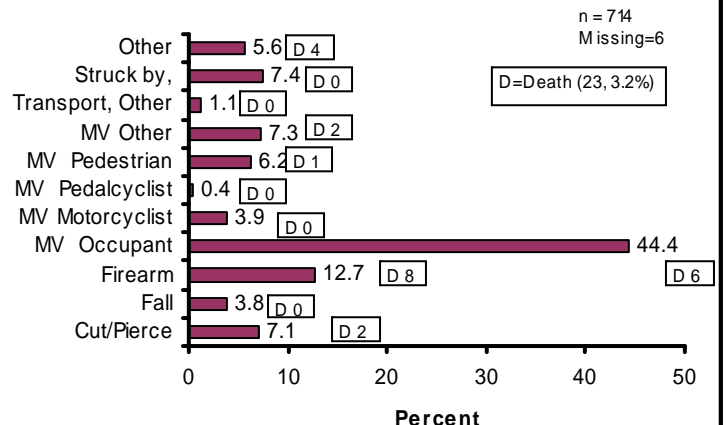


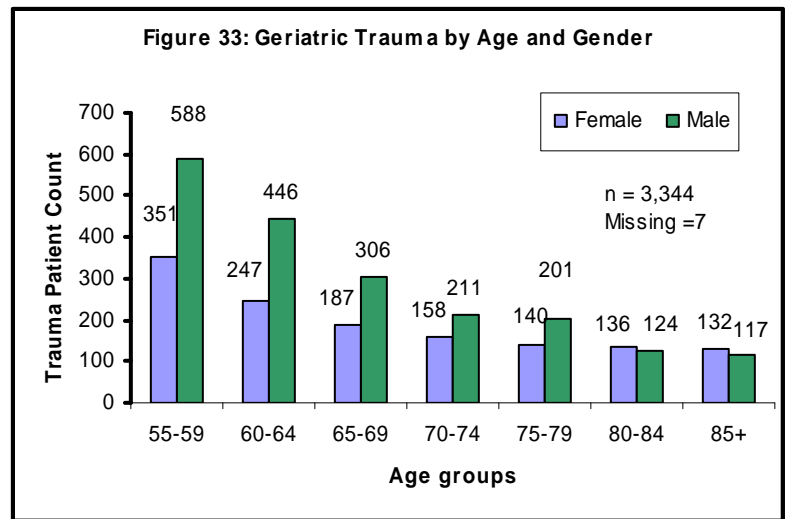
Figure 32: Mechanism of Injury among Pediatric Trauma Patients with Positive Drug Screen Test



Geriatric Trauma

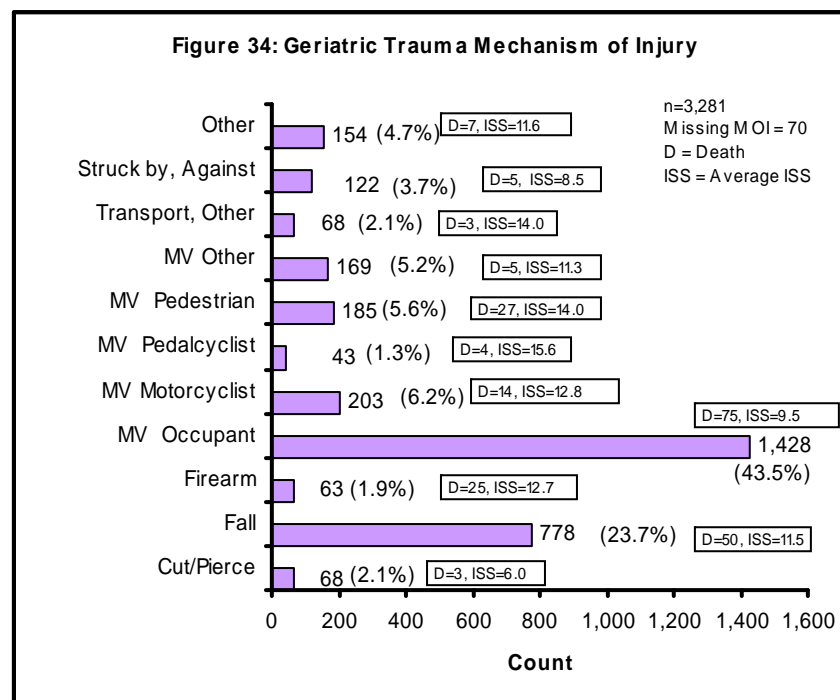
Geriatric Trauma by Age and Gender

Overall, 3,351 geriatric patients aged 55 years and older were admitted to reporting hospitals across the state in the year 2006. The proportion of males is higher than females in all age groups until age 79, then the proportion of trauma cases is higher among females than males (Figure 33).



Mechanism of Injury among Geriatric Trauma Patient

Once again motor vehicle crash was the predominate mechanism of injury among geriatric trauma patients (43.5%) (Figure 34). Falls was the second highest mechanism of injury among geriatric trauma patients (23.7%). Though the incidence of firearm injuries is lower among geriatric patients (1.9%), it is the most lethal injury with a fatality rate of 39.7% (25).



Geriatric Trauma Patients: Alcohol and Drug Test Results

Alcohol Blood Test Results

Of the 3,351 geriatric patients treated in the reporting hospitals across the state, 273 (8.6%) of the patients tested positive for blood alcohol: 2.3% had an alcohol level of <0.08 gm/100cc and 8.6% had an alcohol level above the legal limit of ≥ 0.08 gm/100cc (Figure 35). Among the geriatric patients who tested positive for alcohol, motor vehicle crash (27.4%) and falls (24.1%) were the predominate mechanisms of injury (Figure 36).

Figure 35: Alcohol Test Results of Geriatric Trauma Patients

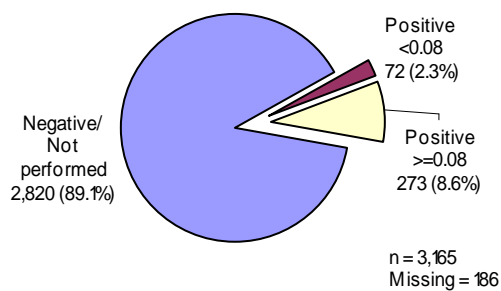
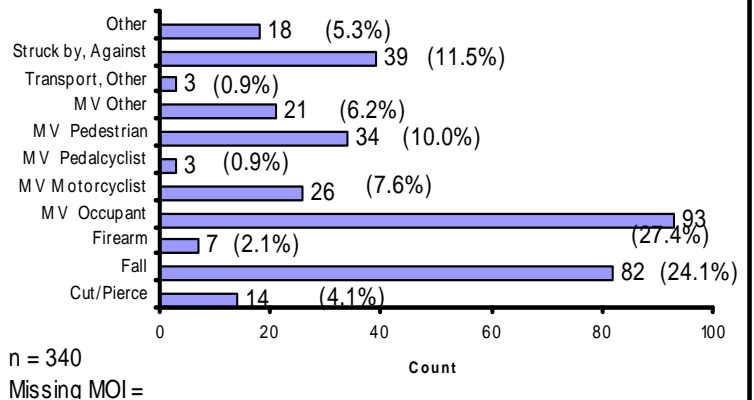


Figure 36: Mechanism of Injury among Geriatric trauma Patients with Positive Alcohol Test



Drug Screen Test Results

Of the 3,351 geriatric trauma patients, 323 (9.6%) tested positive for drug screen test (Figure 37). Once again, motor vehicle crash (40.3%) was the predominate mechanism of injury followed by falls (21.1%) (Figure 38).

Figure 37: Drug Screen Test Results of Geriatric Trauma Patients

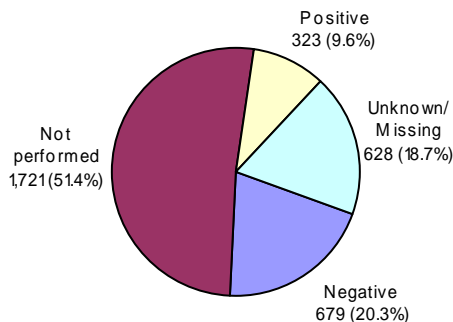
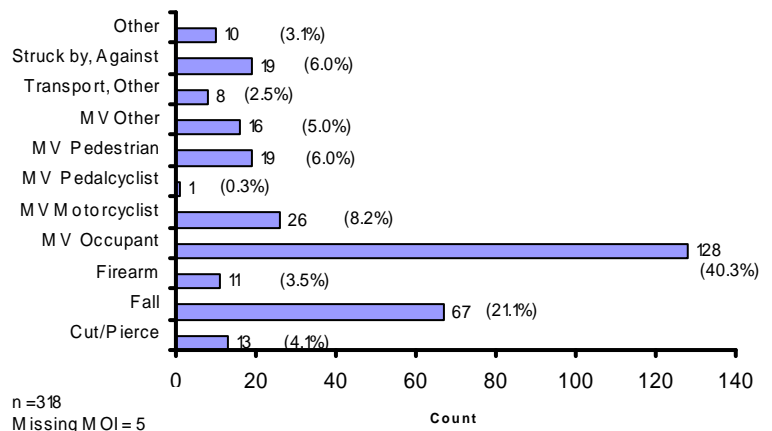
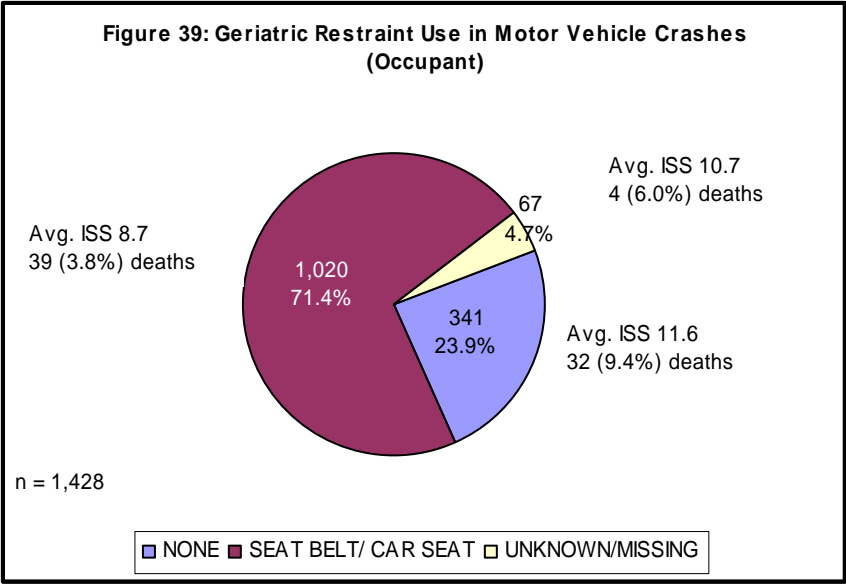


Figure 38: Mechanism of Injury among Geriatric Trauma Patients with Positive Drug Screen Test



Restraint Use in Motor Vehicle Crash

Twenty-four percent of the geriatric patients were using no restraint device (seat-belt) when the motor vehicle they were driving or riding in crashed (Figure 39) . The average Injury Severity Score (ISS) was lower for those who utilized a restraint device (ISS 8.7) as compared to those who did not use any device (ISS 11.6). The incidence of death was also lower for those who utilized a restraint device (3.8%) as compared to those who did not use any device (9.4%).



Mortality among Geriatric Trauma Patients

Of the 3,351 geriatric trauma patients, 220 (6.6%) patients died due to trauma. The highest fatality rate was among patients aged 85 + years (14.5%, n = 37) (Figure 40).

